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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/925,134	08/08/2001	Eliyahou Harari	11587 M-10237-1P US	6957

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EXAMINER	
QUINTO, KEVIN V	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/925,134	HARARI ET AL.	
	Examiner	Art Unit	
	Kevin Quinto	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) *23-28* is/are withdrawn from consideration.

5)☒ Claim(s) *11-22* is/are allowed.

6)☒ Claim(s) *1,2,5-7,9,29,30 and 32-34* is/are rejected.

7)☒ Claim(s) *3,4,8,10,31 and 35* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 1/25/02
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4/24/03
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-22 and 29-35, drawn to an array of non-volatile memory cells, classified in class 257, subclass 319.

   II. Claims 23-28, drawn to a process of fabricating an array of non-volatile memory cells, classified in class 438, subclass 201.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the source and the drain can be formed by diffusion instead of implantation.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Gerald Parsons (Reg. No. 24,486) on September 24, 2003, a provisional election was made without traverse to prosecute the invention of the array of non-volatile memory cells, claims 1-22 and 29-35. Affirmation of this election must be made by applicant in replying to this Office action.

5. Claims 23-28 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 2, 5, 6, 7, 9, 29, 30, 32, and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Taji (JP 10-41414).

8. In reference to claim 1, Taji (JP 10-41414) discloses a similar device. Figures 5(A) and 5(B) illustrate an array of non-volatile memory cells formed in rows and columns on a semiconductor substrate with elongated source (26) and drain (24b) diffusions extending between columns of cells and word lines extending across rows of cells. Each cell has a first channel segment between adjacent source (26) and drain (24b) diffusions in the substrate that is controlled by a storage element (30) and a second channel segment controlled by a select gate portion (40b) of one of the word lines. There are trenches in the substrate which are a part of the cells. The second channel portion of the individual cells is provided along a sidewall of one of the trenches. The select gate (40b) is positioned in the trench. There are elongated third gates (52) which extend across the array and are capacitively coupled with the storage elements (30).

9. With regard to claim 2, the elongated third gates are erase gates that have lengths extending in a direction along rows of storage elements and which are individually positioned between adjacent rows of storage elements in a manner to have a capacitive coupling with edges of the storage elements of at least one of said adjacent rows.

10. In reference to claim 5, one of the trenches passes through the individual cells and said second channel portion of the individual cells and said second channel portion of the individual cells is provided along two sidewalls and a bottom surface of the channel. The source (26) and drain (24b) diffusions are formed in a surface of the substrate outside of the trenches.

11. With regard to claim 6, the individual cells include two storage elements (30) positioned along a surface of the substrate on opposite sides of the trench.

12. In reference to claims 7 and 9, the storage elements (30) are floating gates.

13. With regard to claim 29, Taji (JP 10-41414) discloses a similar device. Figures 5A and 5B illustrate an array of non-volatile memory cells that individually include at least one storage transistor and at least one select transistor in series between source (26) and drain (24b) regions of a substrate. There is at least one storage element (30) of the individual cells being positioned on the surface of the substrate with a first dielectric (not labeled) there between and adjacent one edge of a recess. There is a gate (40b) extending into the recess with a second dielectric (34) such that it forms a select transistor channel along opposing walls and a bottom surface of the recess.

Components of the source (26) and drain (24b) diffusions, recesses, and storage elements (3) are formed in regular non-mirrored pattern in a direction across the array.

14. In reference to claim 30, the storage elements (30) are floating gates.

15. With regard to claim 32, Taji (JP 10-41414) discloses a similar device. Figures 5A and 5B illustrate an array of non-volatile memory cells. Each cell includes source (26) and drain (24b) regions formed in a planar surface of a substrate a distance apart from each other such that a semi-conductive channel for a memory cell is defined. There are first and second memory storage elements (30) positioned over the planar substrate surface adjacent the respective source (26) and drain (24b) diffusions. There is a recess, with sidewalls and a bottom, formed in the substrate surface between the first and second storage elements. A select transistor gate (40b) extends into the recess such that there is field coupling with the recess sidewalls and bottom through a dielectric layer (34) so that the recess sidewalls are a part of the memory cell channel.

16. In reference to claim 34, the storage elements (30) are floating gates.

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

18. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taji (JP 10-41414).

19. In reference to claim 33, Taji does not disclose the exact recess depth.

However:

> Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Therefore claim 33 is not patentably distinguishable over the Taji reference.

Allowable Subject Matter

20. Claims 11-22 are allowed.

21. Claims 3, 4, 8, 10, 31, and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

22. The following is a statement of reasons for the indication of allowable subject matter: the examiner is unaware of any prior art which suggests a non-volatile semiconductor memory device of the split gate/channel type, with source/drain diffusions along the bottom of a trench and utilizes a charge trapping dielectric layer instead of a floating gate.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Quinto whose telephone number is (703) 306-5688. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

KVQ